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(54) **Heat exchange assembly for vehicles**

(57) A heat exchange assembly for vehicles, comprising:

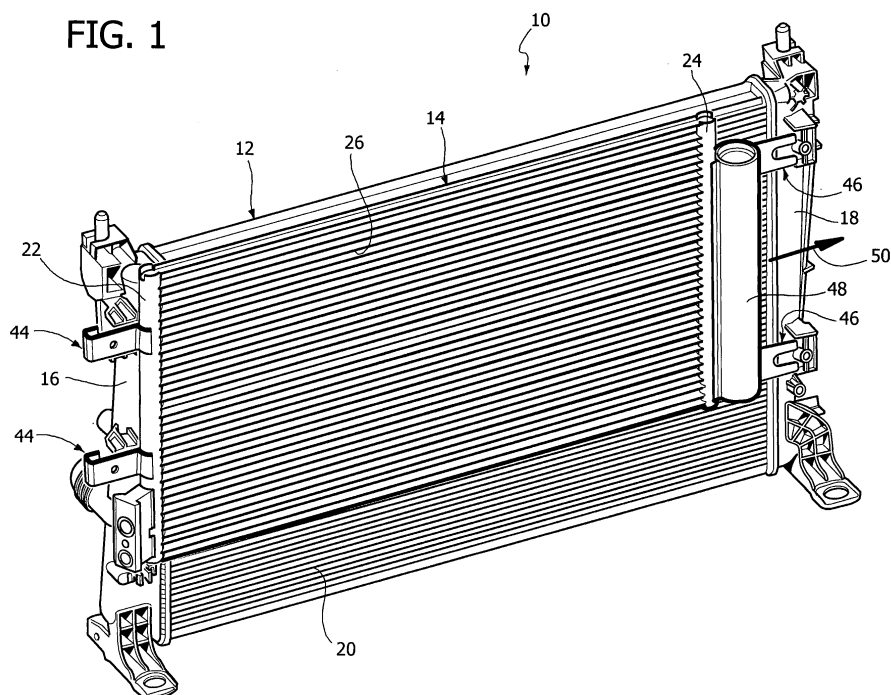
- a radiator (12) comprising a pair of mutually parallel collecting tanks (16, 18) made of plastic material and a tube and fin heat exchange pack (20) with the tubes arranged orthogonally relative to the collecting tanks (16, 18),
- a condenser (14) comprising a pair of mutually parallel tubular distributors (22, 24) and a tube and fin heat exchange pack (26) with the tubes arranged orthogonally relative to the distributors (22, 24), and
- first engagement formations (28, 30, 54) obtained inte-

grally on the collecting tanks (16, 18) by injection moulding, and

- second engagement formations (44, 46, 56) formed by metal flanges fastened to the condenser (14) by braze welding,

the first and the second engagement formations (28, 30, 54, 44, 46, 56) co-operating with each other in mutual insertion relationship to define a condition of fastening as a result of a relative motion of the condenser (14) and of the radiator (12) in a direction parallel to the tubes (50, 60).

FIG. 1



Description

[0001] The present invention relates to a heat exchange assembly for vehicles including a radiator and a condenser fastened to each other. More specifically, the invention relates to a heat exchange assembly having the characteristics set out in the preamble of claim 1.

[0002] In the state of the art, various solutions are known for the relative fastening between radiator and condenser. Known solutions provide for the use of screws, brackets and other fastening components.

[0003] The object of the present invention is to provide a heat exchange assembly for vehicles in which the relative fastening between condenser and radiator is obtained in simple and rapid fashion and minimising the use of separate fastening elements.

[0004] According to the present invention, said object is achieved by a heat exchange assembly having the characteristics set out in the claims.

[0005] The present invention shall now be described in detail with reference to the accompanying drawings, provided purely by way of non limiting example, in which:

- Figures 1 and 2 show the sequence for the relative fastening between a condenser and a radiator of a heat exchange assembly according to the present invention,
- Figure 3 is a perspective view showing the collecting tanks of the radiator of a heat exchange assembly according to the invention,
- Figures 4 and 5 show the sequence for the relative fastening between a condenser and a radiator of a heat exchange assembly according to the present invention, and
- Figure 6 is a perspective view showing the collecting tanks of the radiator of a heat exchange assembly of Figures 4 and 5,

[0006] With reference to Figures 1 and 2, the number 10 denotes a heat exchange assembly for vehicles comprising a radiator 12 and a condenser 14, fastened to each other in the way that will be described below.

[0007] The radiator 12 comprises two mutually parallel collecting tanks of plastic material 16, 18 and a tube and fin heat exchange pack 20 with the tubes extending orthogonally relative to the collecting tanks 16, 18.

[0008] The condenser 14 comprises two mutually parallel tubular distributors 22, 24 and a tube and fin heat exchange pack 26 positioned with the tubes orthogonal relative to the distributors 22, 24.

[0009] The radiator 12 and the condenser 14 are mutually fastened facing each other, with the respective heat exchange packs 20, 26 mutually parallel and with the distributors 22, 24 of the condenser 14 parallel to the collecting tanks 16, 18 of the radiator 12. The radiator 12 and the condenser 14 are provided with respective engagement formations that mutually cooperate in mutual insertion relationship to define a condition of relative fas-

tening between condenser and radiator. The mutual insertion of the engagement formations takes place with a relative motion between condenser and radiator in a direction parallel to the respective tubes.

[0010] With reference in particular to Figure 3, the collecting tanks 16, 18 of the radiator 12 are obtained by injection moulding of plastic material. On each of the two collecting tanks 16, 18 are obtained two engagement formations 28, 30. The engagement formations 28, 30 are obtained integrally with the collecting tanks 16, 18 when they are injection moulded. Each of the engagement formations 28 of the collecting tank 16 comprises a wall 32 projecting from the outer surface of the collecting tank 16 in a parallel direction to the radiator tubes. Each wall 32 extends between two containment elements 34 positioned above and below relative to the wall 32. The wall 32 and the containment elements 34 form a substantially C shaped structure.

[0011] Each of the engagement formations 30 of the collecting tank 18 comprises an opening 36 defined between a planar surface 38, parallel to the radiator tubes, and a bridge element 40. Each engagement surface 30 further comprises a pivot pin element 41 which projects from the planar surface 38 and is arranged centrally relative to the respective opening 36. Each opening 36 is delimited by two containment elements 42, respectively upper and lower.

[0012] With reference to Figures 1 and 2, the condenser 14 is provided with a first pair of engagement formations 44 and with a second pair of engagement formations 46. Each of the engagement formations 44 is constituted by a metal flange fastened by means of braze welding on the outer surface of the distributor 22. Each flange 44 is constituted by sheared and bent metal plate and it has a hook shape able to engage the wall 32 of the corresponding engagement formation 28. The height of the flange 44 is such that each flange 44 is held between the containment members 34 of each engagement formation 28.

[0013] The engagement formations 46 of the condenser 14 are formed by metal flanges fastened by braze welding to a metallic tubular element 48 which in turn is fastened to the outer surface of the distributor 24 and constitutes the outer case of the filter of the air conditioning system. Each of the flanges 46 has a flat engagement portion with substantially fork-like shape, provided with a U-shaped central opening.

[0014] As shown in Figures 1 and 2, the relative fastening between the condenser 14 and the radiator 12 is achieved by placing the radiator 12 and the condenser 14 so they face each other, as shown in Figure 1. Then, the condenser 14 is moved in the direction indicated by the arrow 50 in Figure 1, in such a way as to bring with a single translation movement all the engagement formations 28, 30 and 44, 46 in mutual insertion relationship. Figure 2 shows the assembly at the end of the mounting operation. In the assembled configuration of Figure 2, the walls 32 of the engagement formations 28 are insert-

ed in the respective hook portions of the flanges 44 and the flanges 46 are inserted in the respective openings 36 of the engagement formations 30. In the vertical direction, the condenser 14 and the radiator 12 are mutually fastened by the engagement of the flanges 44, 46 with the respective containment members 34 and 42 of the engagement formations. The pivot pins 41 of the engagement formations are inserted in the U openings of the flanges 46 to determine a precise relative positioning between the radiator 12 and the condenser 14.

[0015] This fastening system allows to obtain the mutual connection between condenser and radiator in simple, rapid fashion and with no need to use auxiliary fastening components. To complete the fastening operation, it is sufficient to provide a single fastening screw to prevent relative motion between the condenser and the radiator in opposite direction from the direction of mounting. For example, a fastening screw can be inserted in a hole 52 of one of the flanges 44 and can engage a corresponding hole formed for instance in one of the walls 32 of the engagement formations 28.

[0016] In the embodiment shown in Figures 1 through 3, the useful width of the heat exchange pack of the condenser 14 is less than the useful width of the heat exchange pack of the radiator 12. Figures 4 through 6 show a variant of the present invention, usable if the heat exchange packs of the radiator and of the condenser have substantially the same useful width. In the variant of Figures 4 through 6, the details corresponding to those described above are designated by the same numeric references.

[0017] With reference to Figure 6, the collecting tank 16 is provided with engagement formations 30 that are constructively identical to those provided on the collecting tank 18 of the embodiment described previously. The collecting tank 18 is instead provided with pivot formations 54 projecting in the horizontal direction parallel to the tubes of the radiator 12. The pivot formations 54 are, for example, formed by two flat walls in crossed arrangement projecting from the outer wall of the tank 18 and obtained integrally with said wall.

[0018] With reference to Figures 4 and 5, the distributor 22 of the condenser 14 has two engagement formations 46 that are substantially identical to the engagement formations 46 of the embodiment described above. A second pair of engagement formations 56 is formed by metal flanges 56 extending orthogonally relative to the directions of the condenser tubes 14 and fastened by means of braze welding to the tubular container 48, which in turn is fastened to the distributor 24. The flanges 56 are provided with respective holes 58 able to be engaged by the pivot pin formations 54. With reference to Figures 4 and 5, the mutual fastening of the radiator 12 and of the condenser 14 is obtained similarly to the above description, i.e. by positioning the radiator and the condenser so they face each other as shown in Figure 4 and moving the condenser 14 with respect to the radiator 12 in the direction indicated by the arrow 60 in Figure 4. Figure 5 shows

the heat exchange assembly once mounting is completed. In this case, too, a single fastening screw can be applied to prevent the mutual disengagement between condenser and radiator in opposite direction from the direction of mounting. For example, said fastening screw can be inserted through a hole 62 of the flanges 44.

Claims

1. A heat exchange assembly for vehicles, comprising:

- a radiator (12) comprising a pair of mutually parallel collecting tanks (16, 18) made of plastic material and a tube and fin heat exchange pack (20) with the tubes arranged orthogonally relative to the collecting tanks (16, 18),
- a condenser (14) comprising a pair of mutually parallel tubular distributors (22, 24) and a tube and fin heat exchange pack (26) with the tubes arranged orthogonally relative to the distributors (22, 24), and
- means for mutually fastening the condenser (14) and the radiator (12),

characterised in that said fastening means comprise:

- first engagement formations (28, 30, 54) obtained integrally on the collecting tanks (16, 18) by injection moulding, and
- second engagement formations (44, 46, 56) formed by metal flanges fastened to the condenser (14) by braze welding,

the first and the second engagement formations (28, 30, 54, 44, 46, 56) co-operating with each other in mutual insertion relationship to define a condition of fastening as a result of a relative motion of the condenser (14) and of the radiator (12) in a direction parallel to the tubes (50, 60).

2. Heat exchange assembly as claimed in claim 1, **characterised in that** it comprises at least one engagement formation (28) including a wall (30) projecting from the outer surface of a collecting tank (16) and delimited superiorly and inferiorly by two containment elements (34) and that said engagement formation co-operates with a complementary engagement formation (44) fastened to the condenser (14) including a hook-shaped metallic flange that engages the wall (32) and held between the containment elements (34).

3. Heat exchange assembly as claimed in claim 1, **characterised in that** at least one engagement formation (30) comprises an opening (36) defined between a flat wall (38) integral with a collecting tank

(18) and a bridge element (40), the opening (36) being delimited superiorly and inferiorly by two containment elements (42), said engagement formation cooperating with a complementary formation (46) fastened to the condenser (14) including a planar flange inserted in said opening (36) . 5

4. Heat exchange assembly as claimed in claim 3, **characterised in that** the engagement formation (30), fixed relative to the collecting tank (18) comprises a positioning pivot pin (41) engaged by a U-shaped seat formed in the complementary flange (46). 10

5. Heat exchange assembly as claimed in claim 1, **characterised in that** at least one engagement formation (54) is shaped as a pivot pin projecting from an outer surface of a collecting tank (18), said engagement formation (54) being engaged by a flange (56) fastened to the condenser (14) having a hole (58) into which is inserted said pivot pin formation (54). 15 20

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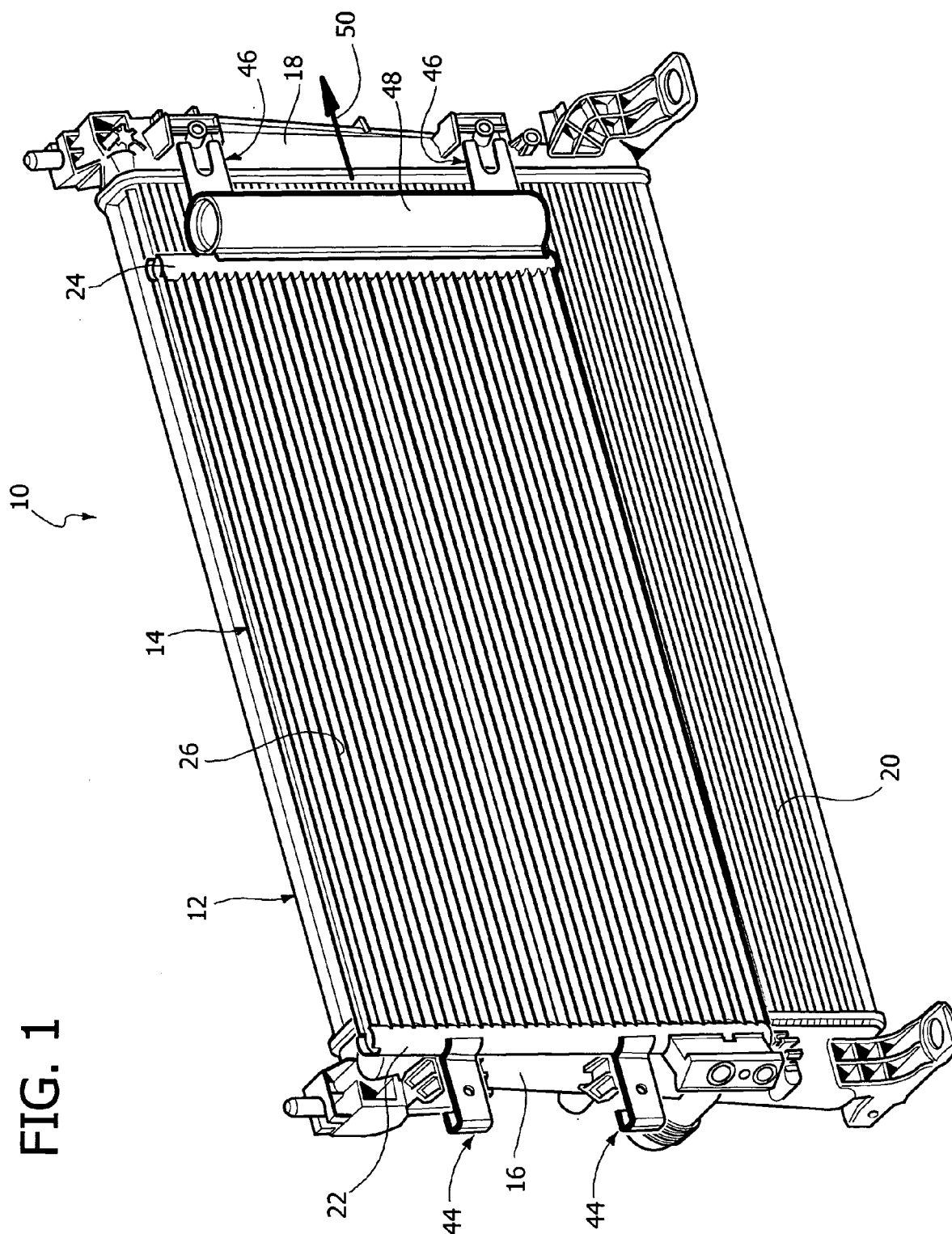
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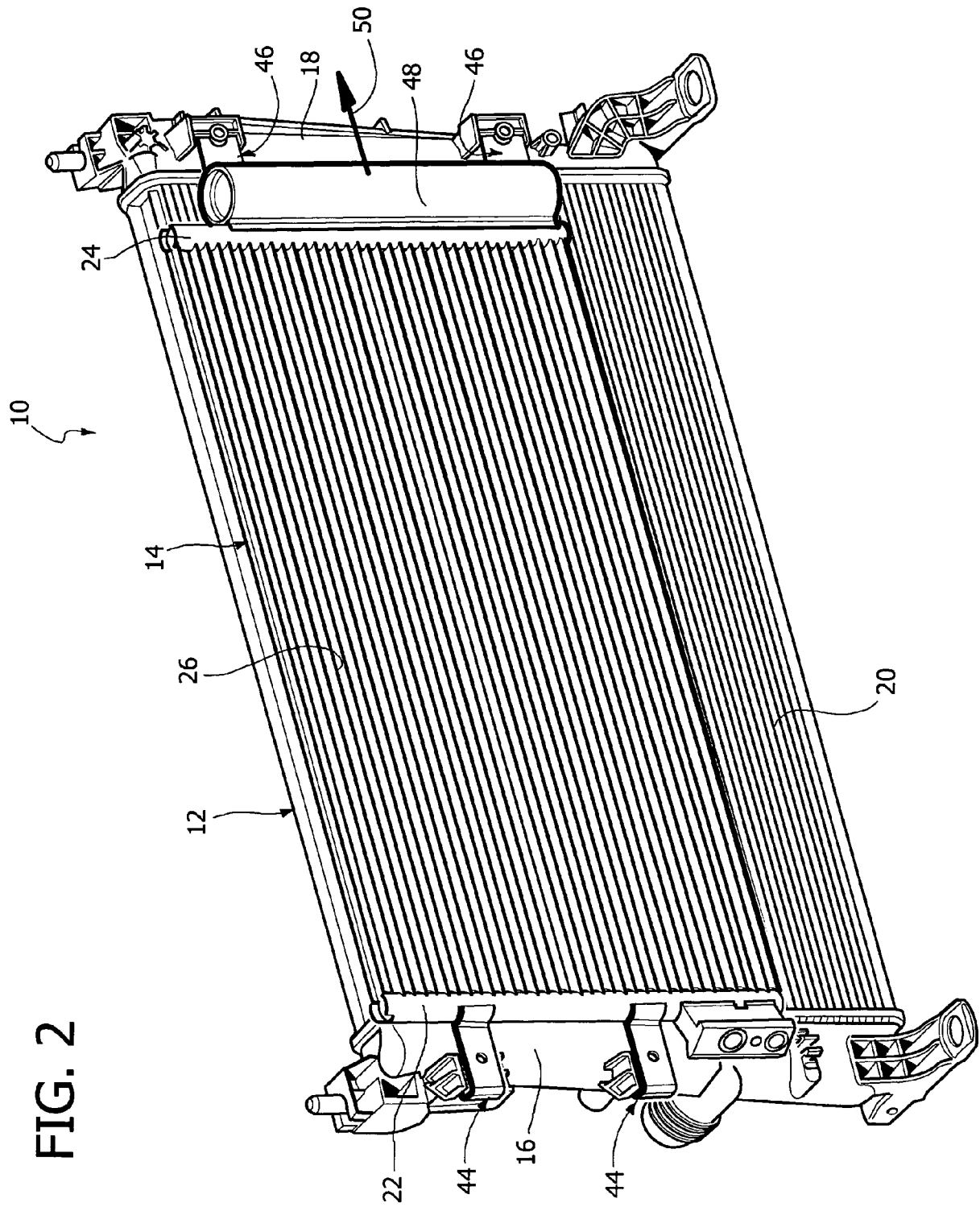


FIG. 3

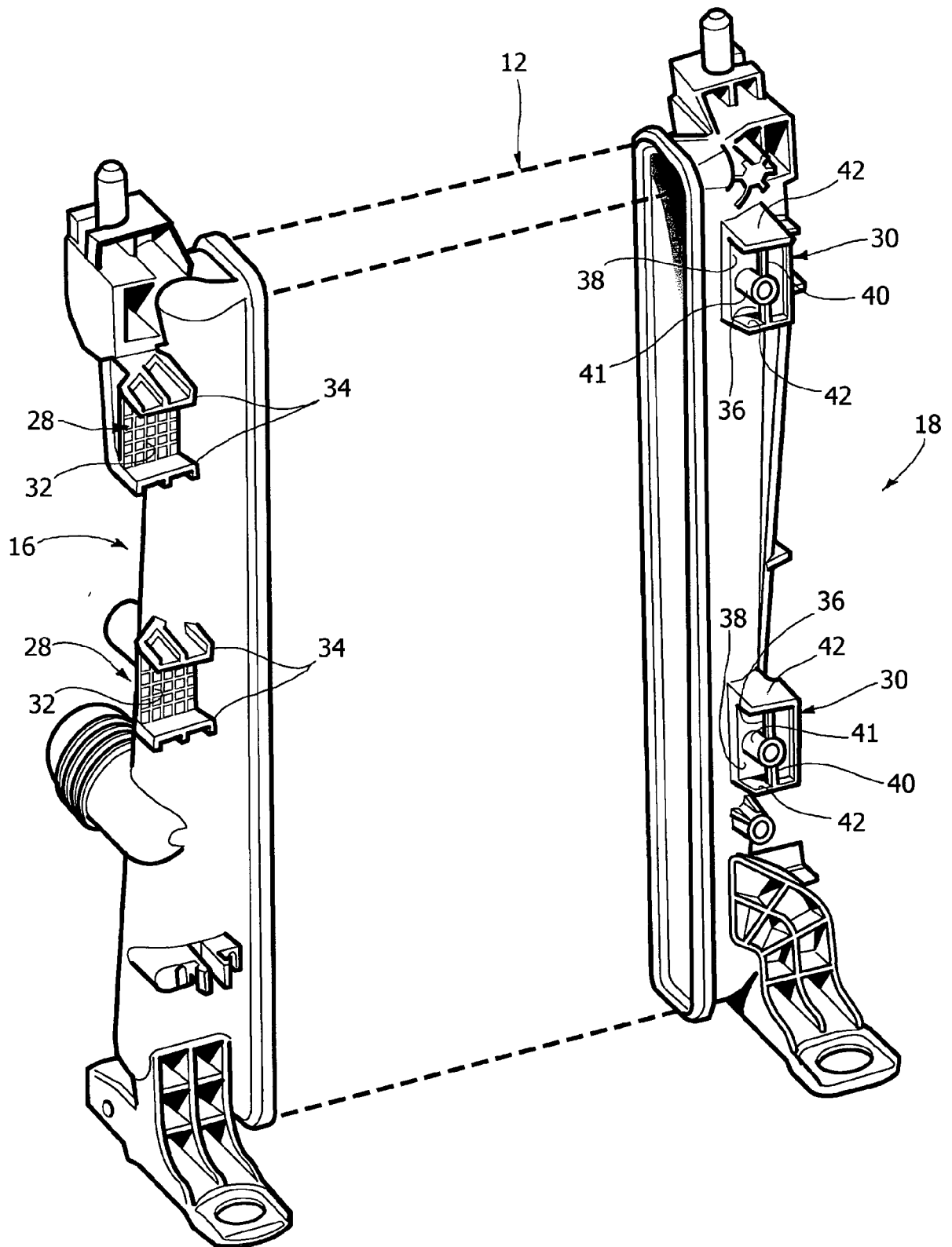


FIG. 4

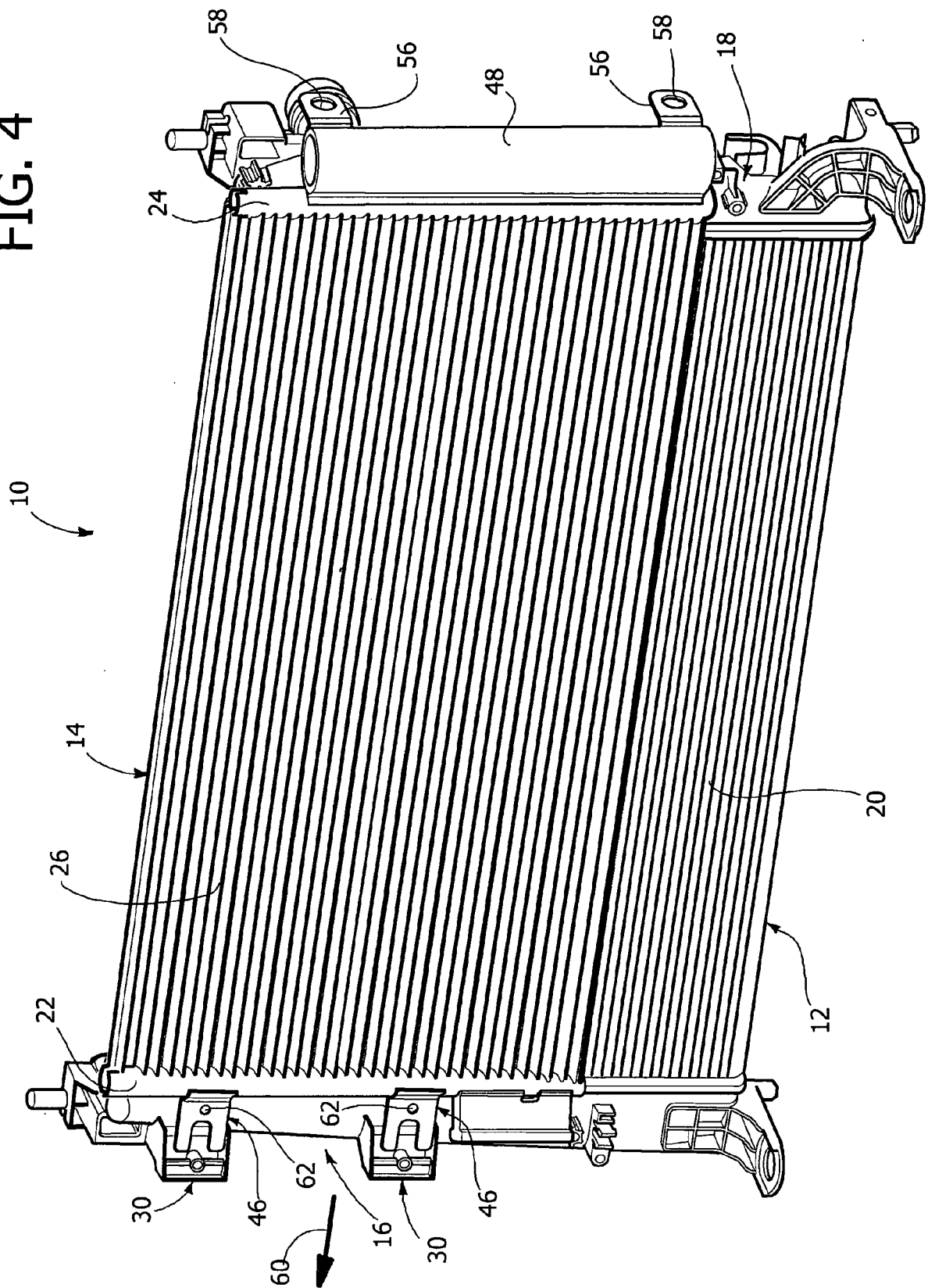


FIG. 5

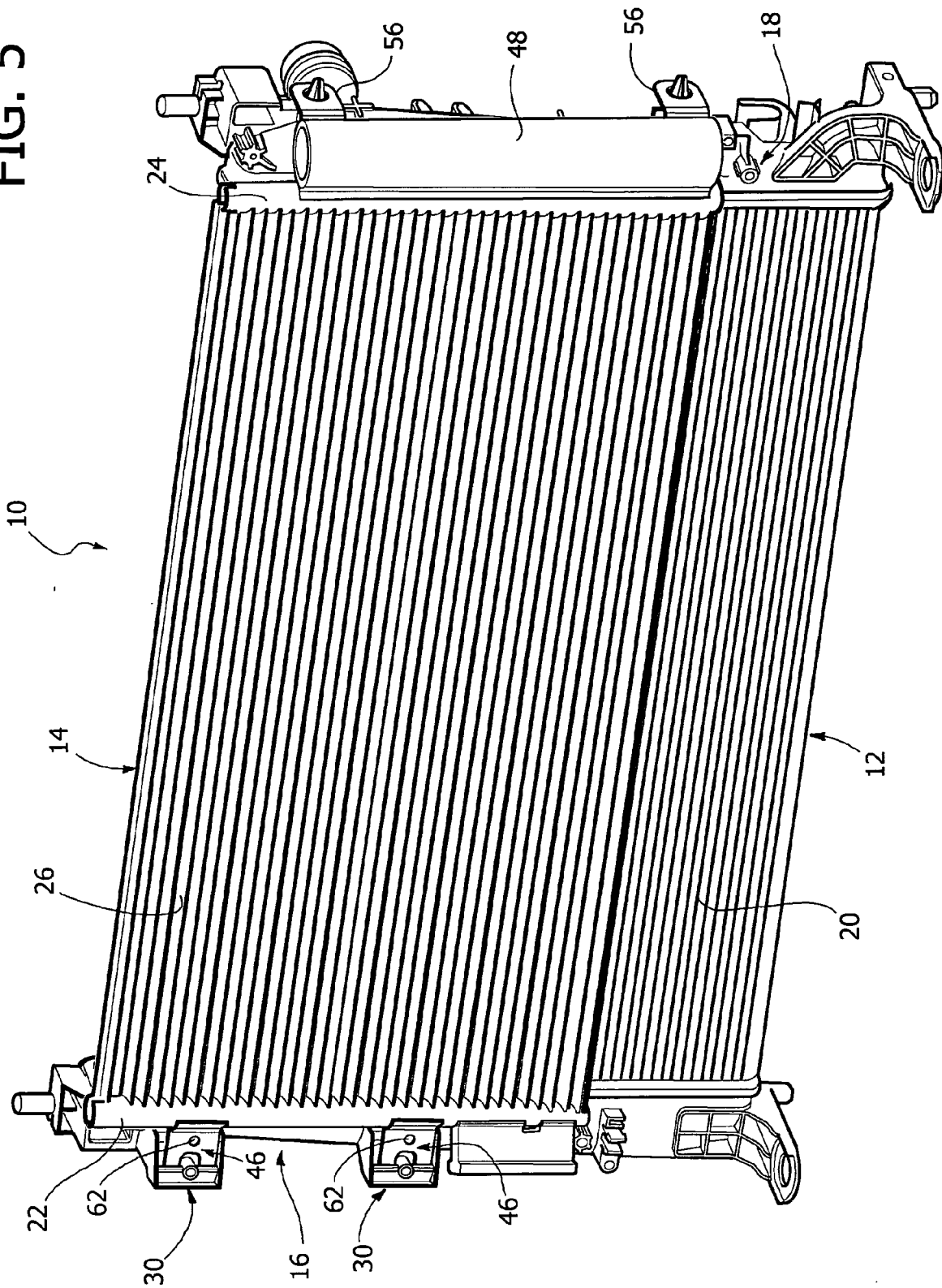
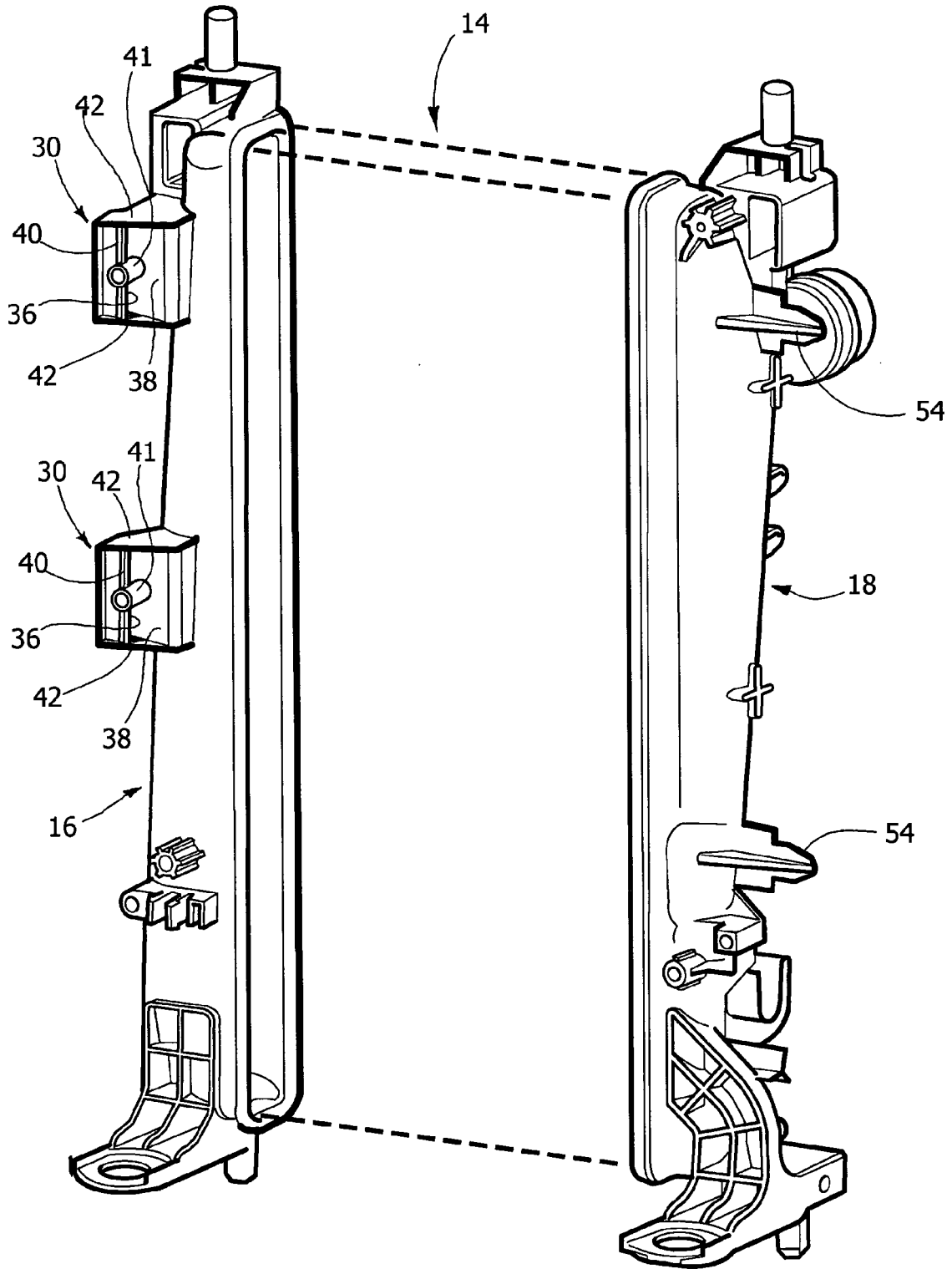


FIG. 6





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Y	WO 2005/038379 A (BEHR GMBH & CO. KG; HEINE, REINHARD) 28 April 2005 (2005-04-28) * abstract * * page 13, line 11 - line 15; figure 1 *	1,3,5	B60K11/04 F28F9/00
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The present search report has been drawn up for all claims			
Place of search Berlin		Date of completion of the search 28 October 2005	Examiner Wiberg, S
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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